
SOME NEW BOOKS.

Mr. Crawford's New Novel.

Mr. F. MABION CRAWFORD has written a good many novels since he puzzled and de-lighted a multitude of readers with his strange story of "Mr. Isaacs," but the expectation raised by that work are now for the first time fulfilled in Paul Patoff (Houghton, Mifflin & Co.). Here again we meet with the conditions which combined to give the author's first tale the charm of novelty and mystery. We are in-troduced to scenes—Constantinople, Para, and the shores of the Bosporus-which, although in a vague way more familiar to us than India, have even less often been portrayed with re quisite precision and vividness in English The power of individualization is strikingly displayed in the three chief actors in the story, Paul Patoff and his brother Alexander, in whom the strong and the untrustworthy types of Bussian temperament and character are exemplified, and a Fanariote Greek, one Gregorios Balsamides, who might have been a contemporary of the later Byzantine Emperors, and who could hardly have been drawn without a profound study of the race which after an intellectual conquest of its Roman conquerors, has in the same way managed to subjugate its Ottoman masters. Eve paratively secondary persons-Prof. Cutter. John Carver, and his daughter Hermic distinct and lifelike. When we add that the traits and interrelations of these people are brought out by an ingenious and sensational plot which to a large extent depends on the unfolding of an obscure and curious patho logical problem, it ought to be patent that we worthy novel.

We believe that they who have themselve en something of Constantinople will concu with us in thinking that the impression mad on the Western mind by that city and its en virons has seldom been more faithfully con veyed. The descriptions of Edmondo de Admicis are not more minutely accurate in respect of outline, color, tone, and sentiment than are those of Mr. Crawford. Read, for instance, the account of a walk through the Valley of Roses, or that of the religious ceremonies n the mosque of St. Sophia on the last night of the month Ramazan. We should like to reproduce the whole of the scene in the mosque, but We must content ourselves with quoting two or three sentences which show how effectively the author conveys not only what he sees, but the meaning of it and the emotion it arouses "A man," we read, "looks down upon the ser ried army of believers, closely packed, but not prowded or irregular, shoulder to shoulder knee to knee, not one of them standing a hair's breadth in front of his rank or behind it, mov ing all as one body, animated by one principle of harmonious motion, elevated by one unques tioning faith in something divine-a man looks down upon this scene, and whatever be his own belief, he cannot but feel an unwonted thrill of admiration, a tremor of awe, a quiver of dread, at the grand solemnity of the unanimou worship of the unseen. And then, as the movement ceases, and the files of white turbans re main motionless, the unearthly voice of the Imam rings out like a battle signal from the lofty balcony of the mastaba, awaking in the fervent spirits of the believers the warlike memories of mighty conquest. For the Osmanli is a warrior, and the nation is a warrior tribe; his belief is too simple for civilization his courage too blind and devoted for the military operations of our times, his heart too easily roused by the bloodthirsty instincts of the fanatic, and too ready to bear the misfortunes of life with the grave indifference of the fatalist. * * * He is a strange being, beyond our understanding, as he is too often beyond our sympathy. It is only when we see him roused to the highest expression of his religious fervor that we involuntarily feel that thrill of astonishment and awe which in our hearts we

know to be genuine admiration. The case of Madame Patoff, whose morbid delusion and malign perversion of the maternal instinct are among the pivots of the plot, is, as we have said, extremely curious; indeed, some readers may deem it too anomalous to use it fiction, whose material, according to an often cited canon, should be not merely the erai, but the vraisemblable. Here is a mother who loves one of her sons with passionate devotion, and detests the other with an intensity that ultimately drifts into insanity, and culminates in attempts at suicide and murder. The phe nomenon would no doubt keenly interest an allenist, and it is just conceivable that the study of it might, as Mr. Crawford represents, constitute the almost exclusive occupation of an eminent investigator of cerebral disorders or several years. But whether it be a theme aesthetically suitable for treatment in a novel

Ancient Egypt.

No book yet published is likely to prove so useful in the way of popularizing the knowledge of ancient Egypt acquired during the present contury as Miss AMELIA B. EDWARDS'S translation of Egyptian Archaelogy by G. Mas-PERO (Putnams). The scientific competence of the successor of Mariette Bey in the work of excavation and interpretation carried on in the Nile valley is too well known to need more than an allusion, but it may surprise some of the readers of this book to find that in the power of effective exposition for which we look to accomplished men of letters, Prof. Maspero is but little, if at all, excelled by Prof. George Ebers. Here we have brought to a focus all the light east upon the civilization of the ancient Egyptiens by their architecture, religions, civil and military, their painting and sculpture, and their industrial arts.

The first fact which it may behoove the reader of this book to keep vividly before him -in the sense of calling on his imagination to apprehend its full significance—is the immensity of the period covered by the extant memorials and records of pre-Christian Egypt. Within the memory of men now living were wont to speak of the Greeks and Romans of the classical era as "the ancients." To them such an epithet can no longer be applied, since the far-reach als of the Nile land have been brought within the scope of man's history. From the epoch of the Ptolemies stretches an expanse of time which, according to Lepsius about twice as vast as that which divides us from the beginning of the Christian era. Owing to the transmutive action of inter vening centuries supplemented by the disrup tive effect of periodical invasions and migra tions, now from Ethiopia upon the south and again from Syria upon the northeast, the builders of the great pyramids had no more, if not less, in common with the carvers of the obelisks, and these again had not more points of identity with the contemporaries of Cambyses or Alexander than have the Italians of to-day with the contemporaries of Cleero and Casar. So that in perusing a compendium like this prepared by Prof. Maspero, and trying to evolve om it some clear conception of how the Egyptians of a given epoch lived, it is of au preme importance not to associate the archi tecture and sculpture of one period with the mural paintings and the vestiges of industrial arts belonging to a third. Such confusion which is constantly exhibited by those who are not vigilant students, is really no less absurd than it would be for a Chinese scholar to construct an imaginary picture of Italian civiliza tion by keeping simultaneously before his eye the tombs of the Etruscans, the Coliseum and St. Peter's. We do not, of course, mean to say that the chronological classification Egyptian monuments is as yet final and exbaustive, but we should at least profit by the remarkable progress made in that direction.

Let us, for example, in this notice confine cursolves to trying to educe some notion of the state of things in the Nile valley under the nineteenth dynasty, a period in which Egyptian art is by most archeologists considered to have reached its apogee, although Prof. Maspero does not concur in this splates without reservation, and seems upon the whole to place the eighteenth dynasty would need but little alteration is order to be

somewhat higher in the scale of civilization. The relation of the period in question to our own era varies according to the system of chronology adopted, but we shall not go far wrong if we say that it roughly corresponded to 1400-1100 B. C. Even within the period covered by this dynasty there was obviously room for much development or change, since it was nearly as long as that which has elapsed since the time of Luther.

It was the Pharaohs of the nineteenth dynasty who made the most imposing additions to the great temple at Karnak, which had been begun as early as the time of Usurtasen I (twelfth dynasty). They added only a hypo style hall and pylon, but the hypostyle measured 170 feet in length by 329 feet in breadth; contained 136 columns, and was 75 feet high to the roof of the great nave, the pylon standing 50 feet higher still. To the same lin of kings is due the outmost and largest court and pylon pertaining to the temple at Luxor The Pharaoha of this dynasty are further credited with completing, if they did not begin, the avenue leading from Luxor to Karnak, a mile and a quarter in length, and bordered on both sides by andro-sphinxes, crio-sphinxes, and couchant rams. As to the architectural type the interior arrangement and equipment of the temples to which they contributed, we must refer the reader to Prof. Maspero's book, and we will only in this place remind them that the inhabitants of Thebes, under the nineteenth dynasty, "saw about as much of their temples as we see at the present day. The sanctuary and the immediate surroundings were closes against them; but they had access to the façades, the courts, and the hypostyle halls, and might admire the masterpieces of their architects as freely as we admire them now."

In a chapter on civil architecture we find col lected all the information yet obtainable with regard to the houses of the ancient Egyptians These were made, as the houses of the fellah eens are now made, of sun-dried bricks. The ordinary Egyptian brick was, at the epoch of the nineteenth dynasty, as it is to-day, an of long block of black clay mixed with chapped straw and a little sand, and dried in the sun burnt bricks and tiles having been, but selder before the Roman period. On the other hand, glazed bricks were common in the Ramesid era. In the Boulak museum there is specimen of glazed green, inscribed in blac ink with the cartouches of Rameses III.: other fragments are colored blue, red, yellow, or white. The nature of the soil does not allow o deep foundations; Prof. Maspero has never seen any ancient house whose foundations were more than four feet deep, and even this depth was exceptional. The slightness of the foundations did not prevent the builders from running up quite lofty structures; in the ruins of Memphis there are house walls still standing from thirty to forty feet in height. In the poorer quarters teen feet of frontage, and consisted of a ground floor, with one or two living rooms above. The middle class folk were better housed: their dwellings were sometimes separated from the street by a narrow court, beyond which the rooms were ranged on either side of a long passage, or else surrounded the court on three sides. Still oftener the house fronted directly on the street, the door being the only opening except, perhaps, a few small windows at irregular intervals. Having crossed the threshold you passed successively through two dimis lighted entrance chambers into a central court, around which were ranged the ground loor offices. These were used as stables for donkeys or cattle, as storerooms for grain and provisions, and as cellars and kitchens. The family lived on the upper floors, which reproduced the ground-floor plan, and were eached by an outside staircase, steep and sarrow, and divided at short intervals by small quare landings. The rooms were oblong and ighted only from the doorway; the few winlows opening on the street were mere air poles near the ceiling, fitted with a lattice of wooden cross bars and secured by wooden shutters. The walls were whitewashed and occasionally painted with bright colors; the floors were bricked or paved, or else were layers of rammed earth. The roof was flat and made apparently of closely laid rows of palm branches covered with a coating of mud thick enough to withstand the rain, Generally there was a small wash house on the oof and a little chamber for the slaves or guards to sleep in. In the domestic life of the ancient Egyptians, as of the Babylonians, "the terrace and the courtyard played an important part; it was there that the vomen gossiped, cooked and made their read: there, also, the whole family was wont to sleep in summer under the shelter of mosquito acts." The mansions of the rich covered a large space of ground; they stood usually in ne midst of a garden or of an enclose planted with trees; the battlemented walls of the court turned a blank front to the street. Inside the enclosure such a mansion was like a small town divided into quarters, the granies on one side, the stables on anothe the dwelling house at the farther end. Of the many pictorial plans of villas extant among the tomb paintings, two are reproduced in this book; they certainly leave upon the mind the impression that a rich Egyptian, in the fifteenth century before Christ, was not only comfortably, but luxuriously lodged. It is true that in palaces, as well as the middle-class houses, the leeping rooms were probably small and dark. but, on the other hand, the reception and liv-

ing rooms were spacious. In a discussion of the military architecture of be ancient Egyptians, Prof. Maspero points out that the so-called pavilion at Medinet-Haboo was intended by its builder, Rameses III., to have a military aspect. It exemplifies the high degree of perfection to which fortresses were carried by the engineers of the nineteenth dynasty. The plan and detailed description of this structure enable us to form an exact conention of the great frontier fortresses which, after the Asiatic wars of the eighteenth and nineteenth dynasties, defended Egypt on the northeast. At this period stone was largely used for fortifications, whereas only crude brick had been used by the earlier Egyptians, who had no engines adequate to the demolition of mastive walls and who knew of but three ways of forcing a stronghold, namely, by scaling the walls, sapping them, or bursting open the gates Owing partly to the new defensive works rected on the Canaanite frontier, and partly to the warlike and aggressive temper of the overeigns of the eighteenth and nineteenth dynasties, their subjects, whose existence we are apt to think of as distressingly insecure. remained tolerably free from apprehension of invasion for about three hundred years.

The chapter on Egyptian paintings is opiously illustrated with engravings of mural secorations. Prof. Maspero contends that, otwithstanding the conventional imposed by tradition upon Egyptian artists, the latter could draw. It is true that they did not hesitate to combine the profile view, fullace view, and three-quarter view in one and the same figure, the object being to exhibit each feature and important section of the figure at its best. It follows that their men and women are actual monsters from the point of view of the anatomists; "yet, after all, they are neither so ugly nor so ridiculous as might se supposed by those who have seen only the wretched copies so often made by modern artists. The wrong parts are joined to the right parts with so much skill that they seem o have grown there. The conventionalities of Egyptian art once accepted, we cannot suffiiently admire the technical skill displayed by the draughtsman. The mixture of artless ce and intentional awkwardness, o rapid execution and patient finish, ex cludes neither elegance of form nor grace of attitude, nor truth of movement. These per onages are of strange aspect, but they live. The author also endeavors to demonstrate by the help of wall paintings, reproduced in engravings or verbally described, that the Egyp tians could not only draw, but were not ignorant of the art of composition. One specimen, at all events, seems to justify the comment

transferred to a modern canvas. Even the absence of perspective was, to some extent atoned for by more or less ingenious contrivances, particularly on the part of the artists of the nineteenth dynasty. Indeed, in the picture of the battle of Kadeeh it is clear that the paint er was not far from grasping the rudimentary laws of perspective, and that these might have been attained had not Egyptian art de clined soon afterward. After showing that this picture furnishes us with a series of illustrated despatches describing a Syrian paign undertaken by Rameses II., Prof. Mas pero reminds us "after this fashion precisely did the painters of the earliest Italian schools depict within one field and with one uninterrupted sequence the several episodes of a sin gle narrative." Subsequently, in an interesting account of

technical processes, including the prepara-

tion of surfaces and pigments, the distinc tion is made that the Egyptian artists did not paint in our sense of the term. All rieties of tone and all the play of light and hadow were merged in one uniform tint. must not, however, be supposed that the effect produced by this artificial system was grating or discordant. The most brilliant hues are placed side by side, but not without full knowledge of the relations subsisting between them, and of the chro matic phenomena which must result. They neither jar together nor extinguish each other On the contrary, each maintains its own value and both by mere juxtaposition give rise to the half tones which harmonize them." We may add that Prof. Maspero concurs with those Egyptologists who hold that Egyptian art evinces the decreptitude of extreme antiquity in the monuments of the fifth dynasty, and that we can only divine what it once was its one extant memorial, the Sphinx of Gizeh, which was old when Cheops was born, and whose construction the priests attributed to the mythical "Servants of Horus." If, then, the Sphinx represent the true culmination of Egyptian art, from which all the other monument remaining in the Nile-land exemplify but so many stages of slow deterioration, how many scores of centuries must we postulate in orde to account for the upward progress of which the prodigious statue at Gizeh was the crown Next to the pyramids, the temples, the obe lisks, the colossal statues, and the mural paint ings, the extant products of the Egyptian lapidary contribute most to our knowledge of the height and character of the civilization attained in the Nile valley thousands of years before the beginning of the Christian era. "It is." Maspero says, "impossible to pass through a gallery of Egyptian antiquities without being astonished at the prodigious number of small objects in pietra dura which have survived till the present time. As yet we have found neither the diamond, the ruby, nor the sapphire but with these exceptions the domain of lapidary was almost as extensive as at the present day. That domain included the amethyst, the emerald, the garne the aquamarine, the chrysoprase, the innumer able varieties of agate and jasper, feldspath and obsidian, besides certain fossils like vellov amber and some kinds of turquoise, such or ganic remains as coral and pearl, and such metaltic oxides as Oriental turquoise and malachite. These substances were for the most part cut in the shape of round square, oval, spindle shaped, pear shaped or lozenge shaped beads." The author goes on to say that "the perfection with which the beads are pierced and the beauty of the polish do honor to the craftsmen who made them. But their skill did not end here. With no tool save the point, they fashioned these materials nto an infinity of shapes-hearts, human finzers, serpents, animals, images of divinities. n which list should, of course, be included beetles or scarabs, "All these," we are reminded. "were probably amulets, and the were probably less valued for the charm of the workmanship than for the supernatural virtue which they were supposed to possess. Commerce dispersed these objects throughout all parts of the ancient world, and many of them were imitated abroad by the Phenicians and Syrians, and by the craftsmen of Greece, Asia Minor, Etruria, and Sardinia." It was not, we subsequently learn, for want of material that the art of modelling and baking clays failed to be as fully developed in Egypt as in Greece, "The valley of the Nile is rich in a fine and duetile potter's clay, with which the happlest results night have been achieved had the native craftsman taken the trouble to prepare it with due care. Metals and hardistones were, however, al ways preferred for objects of luxury; the notter was fain, therefore, to be content with supplying only the commonest needs of household and daily life." Glass was known to the Egyptians from the remotest period, for glass blowing is represented in tombs which date from thouands of years before our era. "Chemical analysis shows the constituent parts of Egyptian glass to have been nearly identical with own: but it contains, besides, a relatively large proportion of extraneous substances which they apparently knew not how to eliminate. Hence Egyptian glass is scarcely ever colorless. but inclines to an uncertain shade of yellow or green." It is a remarkable fact that glass was

largely used in Egypt for counterfeiting precious stones. Although Iron was used for weapons of wa and for tools needed to attack hard substances, bronze, as it is well known, was the favorite metal of the Egyptians. The current opinion, owever, is not well founded, that they suc seeded in tempering bronze so as to make it as hard as iron or steel. Most of the objects hitherto analyzed have yielded precisely the same quantities of copper and tin commonly used by the bronze founders of our day. But many of the Egyptian bronzes offer a surprising resistance to damp and oxiding with difficulty This is because while yet het from the mould they were rubbed with some kind of resinous varnish which filled up the pores and deposited an unalterable patina upon the surface. But as in the present notice we are confining ourselves to the epoch of the nineteenth or Ramesid dynasty, we can only allude to Egyptian bronzes. most of whose extant specimens belong to later periods. Exhaustive information on the subject will be found in the book of Prof. M. W. H. Maspero.

The Science of the Weather

Since the first thunder storm shook the nerves of the infant race of man the human mind has not ceased to interest itself in the weather. Weather saws, like nodules of accumulated wisdom, are found embedded in all literatures, and weather prophets have gained repute through lucky coincidences, though generally deceiving themselves and misleading others, in every age and country. Storms, calms, rains, and winds have been ascribed to all sorts of influences—to spirits of the air, to the gods, to the sun and moon personifled, to the stars:

And all the signs through which night whirls her can from helted Orlon back to Orlon and his dauntless Hound, And all Poseidon's, all high Zeus's stars.

And all Poseidon's, all high Zeus's stars.
Bear on their beams true messages to man."

Yet all the weather lore collected by mankind in thousands of years was not sufficient to make a science. It is only within the last quarter of a century that the study of the weather has resulted in a body of knowledge that may fairly be called scientific. The reason is that meteorology is a science of observation, and that until the electric telegraph enabled us to get as it were a simultaneous view of a large part of the earth's surface, weather observations were too fragmentary and disconnected to lead to general conclusions.

Let the reader put the earth away from him is imagination and look at it as a sphere floating in space. He sees a solid ball surrounded by a thin envelope, or shell, of air. This is densest at the bottom, and rapidly thins away until at the height of say fifty miles it becomes imperceptible. The sun shines down upon the earth through this atmosphere and warms it. Over the equator, where the sun's rays fall perpendicularly, the earth becomes the warmest. At or near the poles, where the sunlight strikes the surface very alopingly, the earth is the coldest. From the equator to the poles the

eat decreases with the latitude. The air is sipally warmed by contact with the earth. Now, we know, as a matter of ordinary observation, that heated air will rise, the reason eing that the heat has driven the particles o air apart, so that, bulk for bulk, it is lighte than cold air. Near the equator, where we may say it is always summer, the air must, ge ly speaking, be hotter than anywhere else. At equator, then, the air will rise, Imn distely the cooler air on either side flows in from the direction of the poles to take its pl The heated air, still being held by the earth's attraction, cannot rise indefinitely, but, having reached a certain height, it flows off in the di rection of the poles to supply the deficiency resulting from the indraught toward the equa tor which its own rise has caused.

Thus through the mere heating of one pa of the atmosphere more than another, we se that a system of currents from the equator the poles and from the poles to the equator has been established. There is an intere position by these currents, resulting in the production of calms on each side of the equator about one-third of the way to the poles, which we need not consider just now. It is enough to remember that the general circulation of the air is such as we have described. Now, if the earth stood still and were perfectly smooth, the air would blow straight from the equator to the poles and vice versa. Meteorolo then be almost an exact science. But the earth rotates rapidly on its axis, and part of its surface is broken by mountain chains and varying elevations of land. These elevations are inconsiderable in comparison with the diam eter of the earth, but they are considerable in comparison with the depth of the atmosphe which is a mere film enveloping the globe.

First let us think what the effect of the earth's rotation is. Recollect, to begin with that the atmosphere, generally speaking, rotates with the earth, that is as a part of it. I the air stood still while the earth rotated, man and all his works would go tumbling around be fore a hurricane whose velocity at the equator would be 1,000 miles an hour, and at New York more than 800 miles. But while the atmos phere, as a whole, rotates with the earth, ye when currents of air flow over the surface to or from the equator the rate of rotation of the moving air, through the principle of inertia. will be slightly different from that of the earth beneath it. Consider, for instance, a current of air flowing toward the equator. While every point on the surface of the earth makes complete rotation in twenty-four hours, the ab solute velocity with which any point move will depend upon its distance from the axis, or we may say from the pole. At one of the pole a point one inch from the true pole, will simply turn round that pole in twenty-four hor mile from the pole a point will likewise make a revolution in twenty-four hours, but it is plain that the velocity of the latter point must be greater than that of point only an inch from the pole. In the same way the velocity increases up to the equator, where it attains its greatest value. Our current of air approaching the equator comes then from a part of the earth where the velocity is comparatively slow, and moves over a surface whose velocity is continually increas ing as it approaches the equator. Owing to its inertia, the air cannot immediately acquire the same velocity as that of the surface beneath ft and so, since the earth rotates from west to east, as the air draws nearer the equator i will, by dropping behind the surface in its rate of rotation, appear in the northern hemisphere to blow over that surface, not directly from the north, but from the northeast. By similar reasoning it can be shown that in the southern hemisphere the direction of the wind caused by such a current will be from the southeast These are the trade winds which are found on either side of the equator up to about 30 of latitude, and are the most constant winds of which we have any experience

Now let us attend for a moment to the interchange of position between the current from the equator and that from the pole which we mentioned above. At about latitude 30° the heated air from the equator, having risen to a great elevation and moved forward, h cooled, until its temperature is lower than that of the air flowing toward the equator beneath it. The two currents then gradually interchange places, and from this point on the cur rent from the equator flows next to the earth's surface, while that from the pole flows over it in the upper air. In the region of interchang the opposing currents result in a belt of calm surrounding the globe. From latitude 30° north then, we have the surface air tending toward the pole, and, as it is moving over a surfawhose velocity progressively decreases, it will gain upon the earth's rotation, and consequently appear to flow not from the south, but from the southwest. Thus we shave the so-called counter-trade winds of the temperate zone which, however, are by no means as constant as the trade winds themselves. Nearer the pole another interchange of currents, and conscment change of direction in the surface winds takes place, producing another system of northeast winds. These two systems of southwest and northeast winds are more or less intermingled in the middle latitudes.

The effect of the inequalities of the earth's urface is to deflect and break up the general atmospheric currents into winds more or less ocal in their characteristics. It is easily seen that a great mountain range, broad and long alleys, and other accidents of the surface may have an important influence upon the direction of the winds. The juxtaposition of land and sea also powerfully affects the motions of the atmosphere, both through difference in heating ower and difference in the amount of mois ture supplied to the air. Upon the whole the effect of the varied nature of the earth's surface is to introduce great complexity into the ir currents over it, and whose broader features are due, as we have explained, first to the con rast as to heat and cold between the equator and the poles, and second to the earth's rotation These general principles of atmospheric circulation must be kept in mind in order to un derstand modern weather science, and we have stated them here as preliminary to an accoun of the present condition of meteorology as it is set forth in an excellent book on Wear RALPH ABERCROMBY (D. Appleton & Co.). We think the author of this book has fairly kept the promise made in his preface, where he says those who have only known meteorology as a dull branch of statistics, the perusal o these pages may, perhaps, open a new prospect in science and a new vision to the mind."

w vision

The cyclone is the great discovery of modern neteorology, and the cyclone, as depicted in Mr. Abereromby's pages, is certainly a pictursque and striking phenomenon; a sort of entity that makes almost as vivid and lifelike an impression as old Boreas himself. A little further in the background, and suggestive of more mysteriousness because its immense nower over the weather is exerted more quietly, stands the anti-cyclone, which is, in all respects, the cyclone's antithesis. These two are the great air gods of the nineteenth century. and, as sometimes happens to the cunninger magicians, the savants who have called them into presence find that they are not altogether amenable to discipline. They overlay the earth. and stalk across the continents and oceans, in obedience to laws which are not yet in all re pects clearly defined.

And right here, before going further, we may as well say that any reader who shares the too common impression that the word opcione means a tornade had better give up all thought of trying to understand meteorology until he has thoroughly disabused his mind of that misinformation. The persistent error of describing the awful tornadoes of the West and South as cyclones has led to the worst sort of confusion on this point. You might as well call a mad cat an elephant as to call one of those whirling terrors a cyclone. What the distinction between a cyclone and a tornado is we shall see later on.

Mr. Abergromby first reports the historical development of meteorology, and shows that vary little real progress had been made up to the middle of the present century. But within the last twenty years the true clue

has been found. The electric telegraph has furnished the means, and the system of synoptic charting has given the results upon which a real science of the weather is founded. It was necessary, before any progress could be made, to work back to general views, and such views are now attainable. A synoptic chart shows us at a glance the condition of the atmosphere at any prescribed moment over the

whole of Europe or the United States.

The magician's wand in this case is the isobar. An isobar is an imaginary line in the atmosphere, or a line drawn upon a chart, which passes through all places having the same atmospheric pressure as shown by the barometer. Having got his telegraphic reports from every part of the territory to be covered, the meteorologist draws his isobars upon the chart, and immediately the cyclone stands revealed, if cyclone there be.

Now let us see what a cyclone is, Suppose

that over a broad region, several hundred miles across, the air, through causes into which we need not here inquire, bec warmer than the surrounding atmosphere. I will manitestly expand and tend to rise. Th barometer gives immediate notice of this con dition by a fall of the mercury, since th pressure of the expanded air is diminished Here we have, then, what is called a region of low barometer. The meteorologist at one proceeds to ascertain the condition, as to ressure, of the surrounding atmosphere. He draws his isobaric lines through all the point where the pressure is equal, and finds that the lines surround the region of low barometer ap roximately as circles, or ovals, one with in another. Suppose, for instance, that barometrio pressure is 25 inches. The line, or isobar, of 29 inches will then form the innermost circle. A hun dred miles further out, let us suppose, a sec

ond circle indicates where the barometer stands at thirty inches. Between these two concentric isobars the pressure gradually in creases from the centre toward the circumfer ence, forming a slope that may be likened to the side of a dish. If the isobars were cle together it is clear that the slope would be steeper; on the other hand, if the isobars were wider apart the slope would be more gentle This slope is called the barometric gradient Upon it the force of the wind depends. We shall readily understand this if we consider what the slope signifies. It simply means gradual decrease of barometric pressure to ward the centre of the territory included in th sobars; that is to say, the air decreases in density toward that centre. It must therefore tend to rise, and as it rises the heavier sur rounding air will rush in to fill up the gap. The moist air from the surface thus rising i great quantities, becomes cooled below the dew point so that its vapor condenses, and s over our area of low barometer we shall behold the formation of cloud and rain. The faster the density increases toward the centre, or the steeper the slope becomes, the faster the uprush and inrush will be, or, in other words, the stronger the winds.

These winds, caused by the air seeking to fill the depression, will blow from all directions toward the centro of the area of low barometer. Since the diameter of this area is several hundred miles, the reader will readily see, upon a little consideration, that the winds cannot blow straight to the centre, but in consequence of the deflecting force due to the earth's rotation, they will approach the centre spirally, and so a rotary motion originates having the centre of the depression for its axis. The direction of this rotation, in consequ of the deflective force we have already described, will always be from right to left, o opposite to the motion of the hands of a watch in the northern hemisphere, and from left to right in the southern hemisphere.

The great circular area of barometic depression we have just described, with its clouds and rain and its system of spirally revolving winds, is a cyclone. In addition to its spiral currents a cyclone has a motion of translation as a whole. In this hemisphere cyclones generally advance in a northeasterly direction, though they sometimes move toward other

though they sometimes move toward other points of the compass. Let us inquire a little more closely what ef fects a cyclone produces. We have already seen that rain and winds are due to it, but it must not be imagined that these evolonic winds appear as whirling or revolving currents to an observer situated anywhere in the cyclone's path. The breadth of the cyclone is too great for that. All that the solitary observer perceive is that as the cyclone passes over him the wind changes its direction in a perfectidefinite way. Suppose he is in the path of an approaching cyclone, but a little south of the sentre. As its front edge moves over him he gets the wind from the sou utheast, and, striking into the downward alope, his barometer begins damp and oppressive, the wind shifts toward the south, and presently the rain area, which occupies the central region of the cyclone, ar rives. The wind gets around into the southwest, and the barometer continues to fall until the central part of the cyclone has passed when, the barometric slope being reversed, it begins to rise. With the rising of the barometer the sky clears, often with a sharp shower or squall, the air becomes cool, dry, and brisk, and the wind comes round into the northwest, blowing in a direction just opposite to that it had at th front of the cyclone. A line drawn through the centre of the cyclone at right angles to the direction of its advance marks what is called the trough, because in front of this line th barometric slope is downward, and back of it the slope is upward. The sudden change in the character of the weather and direction of the wind, which we have described as occurring when the central part of the evelone passe over the observer, occurs when any part of the

The general character of the weather in a eyclone is indicated by what we have aiready said of the sequence of phenomena to an observer over whom a cyclone passes. But our author gives in his book a typical picture of a cyclone, which not only shows to the eye at a glance the condition of things within it, but also illustrates many popular sayings about the weather which experience has tested with out being able to account for the germ of truth found in them. Rheumatic and neuralgic pains and gloomy spirits are known the world over as precursors of foul weather, and Mr. Aber cromby shows that these and other populaprognostics, together with overcast skies, fati ing barometer, southerly and easterly winds, watery-looking sun, increasing dampness and a generally muggy and uncomfortable condition of the atmosphere are characteristic of the front of an advancing cyclone. It should be said that the rain area is rarely concentric with the isobaric circles; usually it extends further in front than in the rear of the pit of the depression. The rear of the cyclone, which means that portion lying behind the trough, differs radically from the front. Here we have rising barometer, northerly and westerly winds, clearing skies, and brisk air. Men's spirits riso with the barometer; rheumatism flees before blue skies and a bright atmosphere. Nature's influences become exhilarating. Our author thinks the popular proverb, "Do business with men when the wind is in the northwest," finds satisfactory explanation in the fact that " northwest wind belongs to the rear of a cyclone and improves men's tempera. But, it may be inquired, how long does it take

trough passes.

for a cyclone to pass? This depends upon the extent of the depressed area, and upon its speed of translation, both of which are variable. Speaking generally, it may be said that cyclones vary from 50 to 2,000 miles in diameter, and are usually several hundred miles across. Their rate of advance in the United States averages about 600 miles in twenty-four hours. It follows that any place may be enveloped in a cyclone from a few hours up to several days.

One very curious fact about cyclones is that they possess a certain individual stability, arising, our author suggests, from their anal-

they possess a certain individual stability, arising, our author suggests, from their analogy to a vortex ring. If a cyclone encounters, or runs up against, an area of high barometer it will glance off or be rebuffed, even though, as Mr. Abercromby remarks, it may be a thousand or more miles in diameter. This fact accounts for the failure of some of the storm pre-

dictions of our own weather bureau. Someor times an approaching sydions is diverted and driven off in an unexpected direction by enocuntering a high pressure area.

III.

And this brings us to the consideration of the great rival of the cyclone among the powclone," to follow our author's definition, "is an area of high pressure surrounded by nearly circular isobara. The pressure is highest in the centre and gradually diminishes outward. The air is calm and cold in the central portion, while on the outskirts the wind blows round the centre in the direction of the hands of a watch, not exactly parallel to the sobars, but spirally outward. Unlike a cyc which is commonly in rapid motion, an anticyclone is often stationary for many days toether. The broad features of the weather in an anti-cyclone are blue sky, dry cold air, a bot sun and hazy horizon, with very little wind-in fact the very antithesis of every-thing which haracterizes a cyclone." Further on marks that an anti-evolone means settled fine weather because it is generally stationary. An anti-cyclone seldom moves onward. It disap-

pears by being broken up or destroyed. As we have likened a cyclone to a dish shaped depression, so an anti-cyclone may be imagined to resemble a vast atmospheric moun tain. These comparisons must not be taken oo literally, for they arise merely from sideration of the barometrie slope. In the cylone the slope is downward toward the centre in the anti-cyclone it is unward toward the centre. like the rise of the flanks of a mountain toward its central peak. In the upper atmos phere, Mr. Abercromby remarks, it is probabl that these conditions of pressure are exactly reversed. The effect of an anti-cyclone upon nimal spirits is, of course, just the opp that of a cyclone. It possesses brilliant sunshine and bright, genial, and enlivening air. One is almost tempted to lay down a maxim for human conduct based on these differences Seek favore and make love in an anti-cyclone

beware of the dog in a cyclone. to be perpetual. One of these always lies over the central part of the Atlantic Ocean, and is of the utmost importance from its influence upon the weather of both the United States and Europe. It is known as "the Atlantic Anti-cyclone." Its northern portion is variable in position, and sometimes stretches up ur til it covers the British islands and part of En rope. In winter an anti-cyclone is generally found lying over Mexico, and our author say that" the col between this and the Atlantic anti-cyclone forms the most prominent feature in the meteorology of the United States sea board." A "col " means a narrow neck of lov pressure separating two anti-cyclones. " analo gous to the col which forms a pass between two adjacent mountain peaks."

Besides cols meteorologists recognize, in addition to cyclones and anti-cyclones. "secondary cyclones," "V-shaped depressions," "wedges," and "straight isobars." These are all minor forms of atmospheric pressure dependent upon their relation to the two primary forms. cyclones and anti-cyclones. Recognized peculiarities of weather belong to all these forms of isobars, but it would require too much of our space to follow Mr. Abereromby in his detailed descriptions of them.

IV. But these regular forms do not include every henomenon of the weather. There are certain outlying phenomena that still puz zle the meteorologist. Mr. Abercromby designates certain winds and rains to whose origin isobars give no satisfactory clue under the term "non-isobaric." The southwest monsoon of the Indian Ocean comes under this head. There occur in the United States what are called "straight-line gales, or ong streaks of wind, two or three miles across blowing at the rate of sixty to eighty miles as tour, and extending over eighty or 100 miles in length." These gales also come under the head of non-isobaric, because they are not associated with any deflection of the isobars Squalls and thunder storms, whirlwinds and tornadoes are likewise treated of under ser arate heads. There is a very interesting kind of storms called by Mr. Abercromby squalis." These are formed by "a long, narrow, thin band of rain and wind sweeping across the country broadside on like a wall or curtain." They are associated with the trough of a cyclone or a V depression. It was one o these squalls that capsized the British man-ofwar Eurydice in the English Channel in 1878

war Eurysice in the English Channel in 1878, causing "one of the greatest disasters which has befallen the British navy in many years." Thunder storms are often associated with these line squalls. Our author describes one of these flying columns of aerial artillery that crossed France, with frightful effect, in the summer of 1879, reaching from the Pyreness to Brussels. "a line of destruction six hundred miles long and from ten to twenty miles broad, sweeping like a curtain across the country at a rate of about thirty miles an hour, wreeking in a few minutes vineyards which are worth thousands of pounds, and destroying at the last moment the husbandman's labor for the whole

ment the husbandman's labor for the whole year."

"A tornado." says Mr. Abereromby. "is simply a whirlwind of exceptional violence. If it were to encounter a lake or a sea, it would be called a waterspout. Its most characteristic feature is a funnel, or spout, which is the visible manifestation of a cylinder of air that is revolving rapidly round a nearly vertical axis. This spout is propagated throughout the northern temperate zone in a northeasterly direction at a rate of about thirty miles an hour, and tears everything to pieces along its narrow path. The diameter of the actual spout often does not exceed a few yards, and the total area of destructive wind is rarely more than three or four hundred yards across."

We do not need to add anything to this description to show how completely different phenomenon a tornado is from the vast area of wind and rain that forms the visible manifesta tion of a cyclone. There is no quarter of the world where the ravages of ternadoes are s frequent and terrible as in some of our Western and Southern States, and every newspaper reader is only too familiar with the story of their strange and dreadful power, so that it is not necessary here to enter further into an ac count of them. Mr. Abercromby remarks that they are "merely episodes in the conflict of opposing currents near the trough of larger depressions," but that they themselves neve give rise to any larger disturbance. He decides against the opinion that there is any interm diate series between whirlwinds and cyclones. or that the former ever develop into th

or that the former ever develop into the latter.

Among the curious and suggestive things to which he calls attention we note two of particular interest. The first is what is called a surge of pressure. This may be best described in the author's own words:

Nothing is more common in winter than to find a moderate-sized cyclone in mid-Atlantic one day, and that though by next morning the shape of the isobars has hardly changed, the whole level of the cyclone and surroundings has perhaps decreased hinf an inch [e., the barometric pressure]. * * In like manner a persistent anti-cyclone will often rise and fall one or two-tenths of an inch without any motion or material change of shape on the chart, while the baremeter at any station will have appeared to rise or fall without any reason or apparent change of weather.

When we look at a series of these surges we find a de-

When we look at a series of these surges we find a decided tendency of the motion to travel from west to east, or from southwest to northeast. For instance, suppose that one day there was a deep depression with one or more cyclones in the United States, an anti-cyclone in mtd Atlantic and a -hallow set of depressions over Europe. We might find by nent morning that the American cyclones were filling up, but that the Atlantic high pressure was lower in level but unchanged in position, while the European system was practically unaltered. The third day might see that, with little change in America, the Atlantic anti-cyclone had regained its fermer level, while a great decrease of pressure had occurred over the whole of Europe.

This is the "barometric wave" of Birt and other writers to which little importance is now attached, but which, the number believes contains the germ of great development. * * A surge of itself has no characteristic weather, but the passars of a surge exercises a moderate inducence on the characteristic weather of any isobaric shape, and a very powerful one on the forma-

These vast atmospheric waves remind us. abound in quanti studies of character, in hu and pathos. The illustrations are capital.

though of course of different origin, of the great undulations of the air that were caused by the tremendous volcanio explosion on the island of Krakatoa in 1883, and which, three

times in succession, encircled the whole earth.

The other interesting point to which we referred is Mr. Abercromby's remarks about difference of kind in rain and wind. Cyclone rain, he says, differs from non-isobaric rain, or the rain in a wedge, one characteristic of cyclone rain being that it appears "to grow out of the air," owing to the dampness that marks the front of a cyclone.

So winds differ. All the world knows that chimneys smoke more with an east wind than with a west one. The explanation suggested is that the winds may not blow horizontally, the east wind being directed downward.

The concluding chapters of his book are devoted to showing what can be and should be accomplished, both by solitary observers and by those who can command the materials for

making syroptic charts in forecasting the

weather. Summaries of the results obtained

by the meteorological service of Great Britain.

the United States. Canada, and Germany, show that the universal Yankee is slightly ahead. In regard to the much-talked-of question of the possibility of forewarning Europe of the approach of a cyclone crossing the Atlantic, Mr. Abereromby concludes that "from the nature of cyclone motion the idea can never be used in practical forecasting." From eight to twenty cyclones, however, do cross the Atlanle from shore to shore in a year. Our author gives a chart showing the paths of some of hem. One is of particular interest, for having started west of our great lakes it crossed the ocean, swept over the British Islands, pursued serpentine course over the German Ocean and the Scandinavian peninsula, then dipped southward half way across Europe, and turning northward again, finally disappeared in the loomy wastes of Siberia. Its whole recorded history lasted twenty days, of which eight were consumed in crossing the ocean from Nova Scotla to Ireland. This remarkable cyclone occurred in July, 1879. Its history is a good example of the variable nature of a cyclone. Not

only was its course erratic and its rate of

travel very unequal, but its intensity and size

varied. Some days the wind blew a gale, at

other times its barometric slopes were so gen-

v.

tle as only to develop a breeze.

And now, finally, recurring to the imaginary picture of the globe with its atmosphere, with which we began, let us see what new features we must introduce, and what the general effect will be when, to the great currents that arise from the inequality of heat between the poles and the equator and from the earth's rotation, we add the influence of the various isobaric forms described in Mr. Abercromby's book. It is evident at a glance that cyclones, anticyclones, &c., may be likened to eddies, ripples, whirks, and backwaters in the general flow of

the atmosphere. A cyclone resembles an eddy

that draws the air upward; an anti-cyclone ar

eddy that draws the air downward. This difference of motion, it can be shown, explains the characteristic difference of weather in the two. They and their related forms of isobars are subsidiary to the great primary currents. Starting from the equator we have first a region of calms and low ba rometer, the dreaded dol lrums," where vessels lie "like painted shins upon a painted ocean." Here the air is rising. The doldrums form a sort of col encircling the earth. At their outer edge are the trade winds, and next comes the region of great anti-cyclones, where the barometer is high and the air is failing. Here are the tropical belts of calms, the "horse latitudes." The great Atlantic Anti-cyclone belongs to this region The trade winds skirt its southern foot, while its northern side is" the birthplace of innumerble cyclones of every size and intensity." The

winter between the Atlantic and the Mexican anti-cyclones.

North of this region of high pressure, where anti-cyclones most abound, comes the temperate zone with its fluctuating pressures, through which cyclones chase one another in endless succession, and where occasionally anti-cyclones of considerable persistence are formed. Upon the position of these depend the principal types of weather.

West India evelones, or hurricanes work round

its northwest corner, and then, turning north-

ward and eastward, follow the line of the col.

of which we have previously spoken as lying in

Still further north we come to the region of prevailing cold polar winds, which, penetrating toward the south, at times produce marked effects upon the weather of the temperate zone. The dipping of the earth's poles now toward and now away from the sun, owing to the inclination of its axis to the plane of its orbit, tends to produce a further fluctuation of weather conditions. In summer, when the northern hemisphere leans sunward, there must be a general shifting of the whole system of atmospheric pressures toward the north; and in winter, when this hemisphere leans away from the sun, a similar shifting must take place in an opposite direction.

As we view the earth in this light, then, we see it surrounded by an atmospheric ocean which is more restless than the sea itself. The heated surface of the earth expands it and drives it upward, the cold of outer spa tracts it, and it sinks again. From the glowing equator it flows off to the snowy poles, and the wheeling globe beneath throws it into diagonal currents, which, deflected by a the usand minor influences, battle with conflicting forces, and swiri into oddying eyclones and anti-cyclones. Meanwhile into this atmosphere, tormented with ceaseless motion, rises the vapor of the ocean. The heated air drinks it up eagerly. But as the air rises in its turn the increasing cold compels it to surrender its vapor, which condenses and falls in rain.

Grouping all these things together, we have the elements, or units, which make up the weather. It requires but a glance to see how hopeless it is to seek to base an exact science upon them. Yet when we take a bird's-eye view we can plainly trace the operation of laws, the study of which cannot fail to make meteorology more and more worthy to be ranked among the foremost of the sciences that are founded upon observation.

BOOK NOTES.

We have received from Thomas Whittaker the Popular Edition" of Whitaker's Almanac, It contains 265 fewer pages of reading matter than the regular edition, but will be found a useful compliation.

Mr. Charles Alfred Byrne is the author of "Dream Land" (Mook, Brothers & Co.), a whimsical and decidedly entertaining book of fairy tales of the present day. The illustrations by Alfred Thompson very adequately supplement the text.

supplement the text.

Thomas Y. Crowell & Co. republish in dainty style one of Count Tolstor's most beautiful stories. "Where Love is There God is Also." It is an embodiment of the purest and truest Christianity, and we are not supprised to learn that it has been widely circulated among Chris-

tians of varying shades of doctrine.

Funk & Wagnalls send us the seventh volume of the Rev. Dr. Joseph Parker's "People's Bible." which carries the undertaking as far as chapter XIII. of the First Book of Kings. It is marked by qualities similar to those noticeable in the previous volumes, and reflects credit upon the industry and zeal of so busy a

man as the author.

Mr. William R. Jenkins, who has reproduced here a great many French books that were worth reprinting, has now issued Lamartine's "Graziella." George Ohnet's "Maltre de Forges," and a little volume of short stories, commencing with one by Jules Clarette, entitled "Boum-Boum," all of which are worthy

of favor and commendation.

Under the title of "Mr. Absalom Billingslea and Other Georgia Folk." the Harpers publish a edlection of stories by Mr. Richard M. Johnston, which have appeared from time to time in various magazines. They illustrate phases of rural life in middle Georgia in times long previous to the war of the rebellion, and abound in quaint studies of character, in humor.